

## The built environment and obesity in UK Biobank: right project, wrong data?



The notion that built environments shape human wellbeing is a cornerstone of public health, empirically confirmed over 150 years of research and today enshrined in social-ecological models and theories. In high-income countries, major risk factors in the built environment are those neighbourhood characteristics that disrupt energy balance and promote obesity by reducing our propensity for physical activity and facilitating consumption of calorific, palatable, yet nutrient-poor foods.<sup>1</sup> Over the past 20 years, there has been a proliferation of research on aspects of the built environment associated with obesity, with attendant innovation in study design, data sources, and analytical approaches, yet results have been mixed.

Studies have faced numerous challenges.<sup>2</sup> To name just a few, sample sizes of studies have long been a limitation, because plausible neighbourhood effect sizes are small. Few studies have explored environment–obesity associations with wide geographical and demographic representation, making generalisability a concern. The required large-scale, detailed epidemiological studies, with measured outcomes, have typically had little person-centred, contemporaneous information on built environment exposures. Built environment exposure metrics across the board have typically been of insufficient quality, without a strong conceptual basis or theoretical congruence with outcomes of interest.

Enter the UK Biobank project: an ambitious initiative launched in 2006 to measure and monitor the health of over half a million adults, sampled from across urban areas of the UK.<sup>3</sup> UK Biobank researchers measured biological, behavioural, and social risk factors of a large, diverse sample, who are followed up through National Health Service records. As part of their enhanced phenotyping effort, UK Biobank took the innovative step of commissioning the development of a database of built environment measures (the UK Biobank Urban Morphometric Platform [UKBUMP]),<sup>4</sup> which were derived with reference to each UK Biobank participant's residential address, and included urban form, greenness, and geographical access to formal physical activity facilities and food outlets of different types.

In *The Lancet Public Health*, Kate Mason and colleagues<sup>5</sup> use data from UK Biobank and UKBUMP to examine

several aspects of the built environment related to physical activity and diet in relation to multiple objective measures of adiposity, comprising waist circumference, body-mass index, and body fat percentage. In doing so, they exploit UK Biobank's unprecedented population-based sample size, broad geographical coverage, and excellent clinical anthropometric measurements, transcending several of the aforementioned challenges. On these grounds alone, their study is a milestone in the field of built environments and obesity. Primarily, they found that greater access to formal physical activity facilities around the home (measured as density of these facilities within 1000 m of home) was strongly and systematically inversely correlated with adiposity. By contrast, associations between access to fast food (measured as proximity to the nearest fast-food outlet) and adiposity were very weak and inconsistent.

What can researchers, advocates, and policy makers take from this? Should we focus on physical activity promotion and abandon efforts to curtail the proliferation of fast-food outlets?<sup>6</sup> Mason and colleagues think not, and as food environment researchers, we agree and strongly suggest these results be interpreted with extreme caution. Regardless of scale, a strong theoretical basis and accurate measurement provide the foundations for robust science. Unfortunately, in addition to familiar concerns related to research of this type, the authors' use of ready-made UKBUMP metrics raises questions for their analysis of fast-food outlets, and might have led to a false negative—ie, the incorrect indication of little or no association with adiposity.

Methods matter in this relatively new field of scientific inquiry,<sup>7</sup> but Mason and colleagues were forced to work with what was available, as opposed to what would be most suitable. The authors used a UKBUMP density metric for physical activity facilities and a proximity metric for fast-food outlets: although these metrics were the only ones available to them within UKBUMP, the scientific rationale for the specification and use of each metric was unclear. Additionally, other food-outlet exposure metrics available from UKBUMP were constructed in a way that precluded their use in accounting for the wider food environment, crucial

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for minimisation of confounding.<sup>2</sup> The authors also provided insufficient information for the reader to judge the quality of their chosen UKBUMP measures. The source documentation cited, which describes the technical specification for the measures, provides no additional clarity.<sup>4</sup> The dates of data collection, and the accuracy, validity, and classification scheme applied to the underlying food outlet database, were not reported. The quality of food environment data could vary geographically, increasing errors. If random, errors in exposure measurement generally dilute the strength of observed associations.<sup>8</sup> Ultimately, Mason and colleagues did as best they could, but relying on metrics created by others meant that they were not well placed to defend the accuracy of these metrics.

As for UK Biobank, their scientific vision to acknowledge and invest in data on the social and environmental determinants of health is laudable. The UKBUMP metrics were commissioned with the best intentions, and they represent an option that will no doubt suit the purposes of some users. Yet, in commissioning these metrics, UK Biobank might have paradoxically constrained the scope and quality of some built environment research by presupposing the domains of built environments most relevant for health and deriving metrics in the absence of well developed programme theories or discrete hypotheses. Hence, it is noteworthy that UK Biobank allows researchers to request anonymised participant address data to create their own built environment metrics, which would probably make for conceptually and methodologically stronger research foundations.

Mason and colleagues' study<sup>5</sup> is a substantial and important piece of public health research, undertaken with great care, but the authors themselves concede that better food environment measures would have produced more robust evidence. This acknowledgment is especially important because of this Article's potential influence on policy and practice. A risk is that superficial

appraisals of this work might consider it definitive and, given the apparently null results, lead some to assert that food environments have little relevance for obesity. Built environments remain an important venue for public health intervention and more high-quality evidence is needed to guide policy. UK Biobank can be an important resource for this research agenda, but researchers will need to work collaboratively to develop metrics tailor-made to their projects, driven by robust and transparent methods and theories. When UK Biobank data were first released, researchers were invited to "Come and get it";<sup>9</sup> we urge researchers not to overlook the option to "Come and make it".

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We declare no competing interests.

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